CLAIMS

What is claimed is:

1. An all-optical switch, comprising:

(a) first and second arms, each arm having a nonlinear optical element for receiving a data stream;

(b) a time delay element having an adjustable time delay value; and

(c) an optical coupler having plural outputs, wherein the time delay value determines which output of the optical coupler that individual data bits or groups of data bits in the data stream are desired to be routed to.

2. The switch of claim 1, wherein the first and second arms constitute a Mach-Zehnder configuration.

3. The switch of claim 1, wherein the optical coupler is a four port device placed at the output of the switch, the device having two input ports and two output ports.

4. The switch of claim 3, wherein outputs of the nonlinear optical elements are fed into the input ports of the four port device.

5. The switch of claim 1, wherein the time delay element delays a signal that controls the states of the nonlinear optical elements.

6. The switch of claim 1, wherein the time delay element delays the flow of data in the data stream.

7. The switch of claim 1, wherein the time delay element comprises a material of variable thickness in the shape of one of a wedge and a staircase.

8. The switch of claim 1, wherein the time delay element comprises a plurality of optical waveguides of various lengths.

9.The switch of claim 1, wherein the time delay element comprises a heating element which changes the properties of an optical waveguide when an electrical current is passed through the heating element.

10. The switch of claim 1, wherein the time delay element comprises a waveguide having a variable index of refraction.

11. The switch of claim 1, wherein the time delay element comprises an optical buffer having a recirculating optical waveguide loop.

12. The switch of claim 1, wherein the time delay element comprises a material upon which an electro-optic effect is imposed.

13. A method of routing data through an all-optical switch, the switch including (i) first and second arms, each arm having a nonlinear optical element, (ii) a time delay element having an adjustable time delay value, and (iii) an optical coupler having plural outputs, the method comprising:

(a) receiving a data stream at the first and second arms; and

(b) adjusting the time delay value depending upon which output of the optical coupler that individual data bits or groups of data bits in the data stream are desired to be routed to.

14. The method of claim 13, wherein the first and second arms constitute a Mach-Zehnder configuration.

15. The method of claim 13, further comprising:

(c) the time delay element delaying the flow of data in the data stream.

16. The method of claim 13, further comprising:

(c) the time delay element delaying a signal that controls the states of the nonlinear optical elements.

17. A Mach-Zehnder interferometer, comprising:

(a) first and second arms, each arm having a nonlinear optical element for receiving a data stream; and

(b) a time delay element inserted in at least one of the first and second arms, the time delay element having a time delay value that is adjusted to select a desired one of plural paths that individual data bits or groups of data bits in the data stream are routed to.

18. The interferometer of claim 17, further comprising

(c) an optical coupler having plural outputs, wherein the time delay value determines which output of the optical coupler that individual data bits or groups of data bits in the data stream are desired to be routed to.

19. The interferometer of claim 18, wherein the optical coupler is a four port device placed at the output of the interferometer, the device having two input ports and two output ports.

20. The interferometer of claim 19, wherein outputs of the nonlinear optical elements are fed into the input ports of the four port device.